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LOWER HATCHIE NATIONAL
WILDLIFE REFUGE

CROPLAND MANAGEMENT PLAN

U. S. Department of the Interior

Fish and Wildlife Service

January, 2002

Introduction

Lower Hatchie National Wildlife Refuge (NWR) was established in 1980 by the Migratory Bird Conservation Commission. The refuge currently encompasses 9,107 acres (Attachment 1). The approved acquisition boundary for the refuge includes 14,122 acres of additional land lying along the Hatchie River in Lauderdale and Tipton Counties approximately 3 miles west of the town of Henning, Tennessee. When fully complete, the refuge boundary will encompass the bulk of the remaining bottomland hardwood forests on the Hatchie River from Highway 51 west until the river's confluence with the Mississippi River. Lower Hatchie NWR is currently administered under the Reelfoot NWR Complex office located in Dyersburg, Tennessee, with a refuge field station located 19 miles west of Highway 51 on Highway 87 near Fulton, Tennessee.

The refuge has excellent potential for wildlife management (particularly waterfowl and other species associated with wetlands and bottomland hardwood forests) and hardwood forest management. Limited public recreational opportunities in West Tennessee makes Lower Hatchie NWR a frequently visited area by hunters, fishermen, and wildlife observers throughout the year.

The primary establishing purposes of the refuge are to provide an inviolate sanctuary for migratory birds and to preserve, for the public benefit, a representative portion of the bottomland hardwood forests. The vision statement for Lower Hatchie NWR is:

To protect, restore, enhance, and manage, in accordance with the purpose for which the refuge was established, a unique remnant of the riverine bottomland hardwood ecosystem that once dominated the Mississippi Alluvial Valley, to provide critical habitat needs for fish and wildlife, emphasizing wintering waterfowl and other migratory birds, and to provide a broad spectrum of opportunities for visitors to appreciate its diverse biological resources.

The Lower Hatchie NWR Cropland Management Plan is in full accordance with the refuge establishing purposes and mission. Additionally, this plan is a valuable step down plan in response to the Reelfoot NWR Complex Comprehensive Conservation Plan (CCP).

Habitat types on the refuge include palustrine and lacustrine areas, bottomland hardwood forest, semi-permanent grasslands, upland forests, miscellaneous administrative lands, and croplands. Developed impoundment areas on the refuge adjacent to the Mississippi River are managed for ducks, primarily mallards, and the Mississippi Valley Population of Canada geese. The bottomland hardwood forests and the cropland areas are the dominant habitat types on the refuge, comprising 5280 acres (58%) and 1278 acres (14%) respectively.

The average annual rainfall in the vicinity of the refuge is near 50 inches. The wettest period of the year is January through March, with rains and river flooding conditions common. The driest period of the year is late-July through October, when rainfall is

limited and river levels are at their lowest. In most years the cropland areas are flooded by backwater from the Hatchie River. However, Hatchie River levels are affected by Mississippi River levels. High water in the Mississippi will act like a dam, causing the Hatchie River to back-up and flood its banks. Extremely low Mississippi River levels will tend to draw out water from the Hatchie River, even if heavy rains have elevated the Hatchie River upstream.

Several main soil types occur on the refuge including Amagon-Oaklimeter silt loam, Robinsonville-Crevasse-Bruno sandy loams, Sharkey series clays and clayey loams, and Memphis-Adler-Loring silt loams.

The West Tennessee Wildlife Resources Plan (January, 2002) breaks down the waterfowl foraging potential for all public wildlife areas within west Tennessee. Under this plan, at current refuge acreage, the potential exists for 2.3 million duck use days (DUD), based on a 110 day wintering period. Additionally, given future land acquisitions, the probability exists for an additional 2.8 million use days. Together, this brings the refuge's approved total duck use day objective to 5.1 million. In addition, the refuge has a goose use day (GUD) objective of 500,000 GUD's. The refuge currently provides enough forage to reach this goal and no further goose specific management is planned.

Meeting the minimum waterfowl maintenance objectives (providing wintering and migrating habitat) can be achieved in part through a successful cropland program. By incorporating a system of impoundments with the cropland program, the waterfowl maintenance objectives should be easily achieved. Preferred waterfowl crops include corn, milo, millet, wheat, buckwheat, and natural (moist-soil) foods. By planting crops such as corn or millet in impoundment areas, their availability to waterfowl can be enhanced through flooding in the fall/winter. Portions of the cropland area are on upland and highly erodible sites and are best suited for haying and winter wheat planting. In addition, certain portions of the cropland area tend to be wetter longer than others and are best suited as moist-soil management sites.

The annual winter (110 day period) food requirement for meeting the current 5.1 million duck use day objective can be met with the annual production of 182 acres of corn (capable of being flooded), yielding an average of 75 bu/ac, in combination with 299 acres of managed moist soil. Currently, the capability exists for providing a maximum of only 79 acres of flooded corn and 190 acres of managed moist soil. As a result, opportunities for making up the deficit as new agricultural lands are acquired will continue to be explored.

Similarly, the annual (110 day period) food requirement for meeting the 500,000 goose use day can be met with an annual production of 44 acres of dryland corn, yielding an average of 75 bu/ac, in combination with the approximately 130 acres of harvested soybeans that is available on a yearly basis. Any deficit can be met by providing green browse in the form of winter wheat.

Cooperative Farming Program

A "cleared areas" management plan/program was initiated on Lower Hatchie NWR as agricultural lands became available during the initial land acquisition phase of the refuge. The cooperative farming program has been in place since 1982 using the "cleared areas" document in lieu of a croplands plan. The first formal farming/agricultural management plan was developed in January 1995 and is superseded by this document.

Early in the program the refuge maintained agreements with five (5) different farmers. Changes in management needs and administration priorities have reduced the number of cooperative farmers from five to two (2). Contracts with cooperative farmers are renegotiated annually prior to the planting season. At that time the acreage amount and location of the cooperative farmer's share and refuge share are negotiated and all provisions of the agreement are discussed and agreed upon by both parties. The agreement is then signed by the cooperative farmer and the Service representative (refuge manager). Shares are acreage based with a 75% cooperators share and 25% refuge share. The cooperator assumes responsibility for all associated costs for the crops raised. Modifications to the original contract may occur throughout the farming season with amendments agreed upon and signed by all parties involved.

Special conditions stated in the agreement include the following:

1. Preferred seeding dates for refuge share of crops are:

Corn:	March 25 - May 30
Soybeans:	April 25 - July 1
Millet:	May 1 - July 15
Milo:	May 1 - June 15
Buckwheat:	July 15 - Aug 15

In the event a preferred seeding date cannot be accomplished, the Cooperator(s) must contact the refuge manager immediately to schedule alternate dates or crops prior to planting.

2. The Service will specify its share to be left standing in the fields, harvested, mowed, or to be logged by the Cooperators(s). The cooperator will notify the Service of any harvesting activity at least 48 hours prior. All manipulations must be completed within 48 hours from the dated of notification unless weather conditions prohibit work.
3. All crops will be fertilized/limed according to current University of Tennessee Soil Testing Laboratory analysis. Soil tests must be taken every three years. The cooperator is responsible for all soil testing and will provide the Service with the soil test results in designated years.

4. Cooperator (s) will not be permitted to use any herbicide or insecticide prior to the completion and approval of a Pesticide Use Proposal. The attached list of approved chemicals is provided. Cooperator (s) may submit additional pesticide use proposals in writing to the manager for emergency approval.
5. The Cooperator (s) must notify the refuge manager 24 hours in advance of any proposed application of fertilizer, herbicide or insecticide.
6. The Cooperator (s) must read and strictly comply with all label instructions on any pesticides used.
7. The Cooperator (s) must meet Tennessee Department of Agriculture requirements for Pesticide Applicator Certification.
8. Cooperator (s) agree that they will not permit the draining or dumping of any materials, and must remove same from the refuge at the end of each day.
9. All farming operations are to be conducted in accordance with the Occupational Safety and Health Administration (OSHA) guidelines.
10. The Cooperator (s) will control weeds by cultivation during the growing season if necessary.
11. Weeds and woody vegetation in field borders and turnrows will be controlled by the Cooperator (s) by mowing only (no earlier than July 15).
12. Pesticides approved for use (see attached) will not be allowed unless the level of pest occurrence observed as a result of crop scouting indicates the pest density is at the economic threshold level. The Cooperator (s) is responsible for crop scouting.

Moist Soil Management

Managing for the production of natural wildlife food and cover plants is an accepted option for managing seasonally flooded impoundments in many parts of the United States. A discussion of moist-soil management is appropriate within the context of this plan due to the marginal nature of much of Lower Hatchie NWR agricultural lands. Approximately 185 acres of cropland in the waterfowl sanctuary portion of the refuge (fields 12, 13, 15, 16, and 17) are more adversely affected by river flooding and poor drainage than other fields on the refuge. In most years, these agricultural fields are undesirably wet through April and seldom dry sufficiently enough to plant desired crops such as corn. Planting crops in these marginal areas has historically been rotated between the Service and the cooperator. In most years, only late-planted crops such as "cooperator-share" soybeans or "Service-share" millets or moist-soils have been successful. Therefore, these areas are best managed for moist-soil seed production.

When managed for moist soils, these areas produce outstanding stands of wild millet,

smartweed, sedges, sprangletop, and other food species in spite of poor water management capability. Soil disturbance is required to maintain moist soil areas in desired successional stages for waterfowl management. Most desirable wild food plants are early successional, high seed producing annuals. The wetness of these fields limits the ability to use mechanical methods to control weeds until late in the planting season.

The rotation of these wet areas between moist-soil management and row crop farming would be an appropriate method to control undesirable plant encroachment and “set-back” woody plant succession in these sites. Rotations would be no more frequent than two years or as moisture conditions permit. Rehabilitation of the levee system for better water control and the installation of a water delivery system would permit more traditional moist soil management to occur, using water levels to control vegetation. Rotational schemes for integrated pest management in moist soil areas must be flexible. Frequently, the highest moist soil production is in years immediately following a row crop.

Generally, moist soil management for migrant and wintering waterfowl involves draw downs in spring or early summer. Supplementary actions such as disking or shallow flooding may be required after plants are established. For example, cocklebur, one of the major undesirable herbaceous plants at Lower Hatchie NWR, is easily controlled in its seedling stage by shallow flooding for 24 - 48 hours. Moist-soil areas can be re-flooded in fall to make seeds available to migrant and wintering waterfowl. Options are also available to manage moist soil areas for wading birds, shorebirds, passerines, and other wildlife.

Proper timing and duration of draw downs vary with locale and management objectives. Draw down schemes are developed best when based on several seasons of experience in a given area. Ideally, after several years of experience, draw downs can be scheduled on a basis of phenology rather than calendar date.

Moist soil management has several advantages over conventional row crop farming. These include:

1. Lower costs for fuel, fertilizer, and seed because natural plants do not require cultivation, are site adapted to soil nutrients and seed is readily available in the soil bank.
2. Greater diversity of plant species and vegetation structure that supports a more diverse fauna.
3. A more nutritionally complete diet for waterfowl than provided by crop monocultures.
4. Potential for higher energy efficiency – a greater caloric return in wildlife food for the energy invested than for farming.

Major disadvantages of moist soil include:

1. Natural plants usually cannot produce as much total food per acre as properly cultivated crops.

2. Moist soil management requires more time investment by professional personnel than cooperative farming. Regular inspections of moist soil fields, especially during draw downs, are necessary to identify responding vegetation and initiate measures to control undesirables or stimulated desirable species.
3. Both moist soil and row crop options are subject to adverse weather, but there are usually desirable moist soil species available to respond to a variety of conditions.

The refuge moist soil management program is in need of a system rehabilitation. Currently the impoundment system in which moist soil management occurs does not allow for proper water management abilities. Without complete water level control in these areas, the system is truly not considered under moist soil management. Levee redesign/construction, water control structure installation/replacement, and the development of a consistent water source (well and pump) are critical to the program. Nearly 150 acres of the impoundment system could be managed annually for moist soil plants. Currently, the areas used for moist soil management are rotated between soybean/corn/millet crops and wild moist soil plants depending upon annual planting conditions.

Management Units

Lower Hatchie NWR cropland operations are located in the Lauderdale county portion of the refuge (Attachment 2) in west Tennessee. However, with the approval for refuge expansion, new lands may become available from future acquisitions. Portions of these lands may contain open croplands that will be farmed under the parameters of this plan until a management decision is reached to maintain the property as a moist soil/cropland area or to reforest the parcels in accordance with the forest management plan.

The refuge cropland unit is bordered on the west by the Mississippi River and is accessed by Highway 87 West near Fulton, Tennessee. The unit includes upland and lowland fields, bluff habitat, ponds and sloughs, ditches, levees, and wooded areas. The Natural Resources Conservation Service (NRCS) has designated the area as farm number 3373. Management of this farm supports the entire moist soils management program and dominates much of the refuge waterfowl sanctuary. The operation contains the entire refuge impoundment system and produces the majority of the waterfowl food required to meet the refuge objectives. The cropland unit occupies 28 farm fields covering approximately 865.45 acres (Attachment 3). These farm fields include both upland and lowland farming areas.

Under the cooperative farming agreement, acreage is divided by a 75/25 (%) farmer to refuge ratio with the refuge usually receiving its portion on the lower/wetter fields of the unit. As a result, crops which were planted for the refuge could be flooded for waterfowl use. However, without adequate water control in these areas it is likely that early planted crops such as corn would be flooded and killed before maturing or that high water in spring would prevent the refuge share from being planted at all.

The fields which are considered the lowest in the impoundment system have been

identified earlier as moist soils management areas and occupy nearly 185 acres in the farm unit. This extremely low 185 acre portion can produce excellent crops of late-planted soybeans and early-planted corn. However the corn planting is strictly dependant upon Hatchie and Mississippi River levels and the ability to drain the fields by late spring.

Other low-elevation fields in the impoundment system include 6, 8, 9, 10, and 11; however these fields are slightly higher than those identified for moist soils management. Row crops such as soybeans, milo, and corn can be planted on these sites with the latter two crops producing well when planted early. Fields 14, 21, 23, and 25 are also considered low and will flood in wet years, but these fields are not impounded by levees. All of the remaining fields in the unit are considered higher elevation fields, some of which (1, 2, 3, 4, 18, 19, 20, 22, 24, 26, 27, and 28) never flood at all. Row crops such as soybeans, corn, and milo have been planted historically with excellent production on dryer sites. Fields 27 and 28 are considered Highly Erodible Lands (HEL) and are reserved for haying only.

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LOWER HATCHIE NATIONAL
WILDLIFE REFUGE

CROPLAND MANAGEMENT PLAN
ENVIRONMENTAL ASSESSMENT

U. S. Department of the Interior

Fish and Wildlife Service

January, 2002

I. Purpose and Need for the Action

A. Introduction

Lower Hatchie National Wildlife Refuge is located immediately adjacent to the Mississippi River and lies along either side of the Hatchie River in Lauderdale and Tipton Counties, Tennessee. The refuge was established on June 19, 1980 under the authority of 16 U.S.C. Sec. 715d (Migratory Bird Conservation Act) "for use as an inviolate sanctuary , or for any other management purpose, for migratory birds." Subsequent land purchases were made under the authority of 16 U.S.C. Sec. 460k-1 (Refuge Recreation Act) "suitable for - (1) incidental fish and wildlife-oriented recreational development, (2) the protection of natural resources, (3) the conservation of endangered species or threatened species". The refuge boundary encompasses the bulk of the remaining bottomland hardwood forest west of Highway 51 along the scenic Hatchie River.

The total current size of Lower Hatchie NWR is 9,107 acres. Land types include palustrine and lacustrine areas, bottomland hardwood forest, semi-permanent grasslands, upland forests, miscellaneous administrative lands, and croplands. Developed impoundment areas on the refuge adjacent to the Mississippi River are managed for ducks, primarily mallards, and the Mississippi Valley Population Canada geese. The bottomland hardwood forests and the cropland areas are the dominant habitat types of the refuge, comprising 5,280 acres (58%) and 1,278 acres (14%) respectively. The refuge is dotted with open water areas including Champion, Little Champion, and Shingle Lakes, and King and Teal Pond.

With an additional 14,122 acres approved for acquisition, the refuge has excellent potential for wildlife management (particularly waterfowl and other species associated with wetlands and bottomland hardwood forests) and hardwood forest management. Local public recreational opportunities are limited, making Lower Hatchie a frequently visited area by hunters and fishermen throughout the year.

B. Cropland Management Objectives

Section 6 RM 4.1 of the National Wildlife Refuge System (NWRS) Refuge Manual states, "Service policy is to use the most natural means available to meet wildlife objectives. In situations where objectives cannot be met through maintenance of more natural ecosystems, the more intensive and artificial method of cropland management may be employed. The acreage devoted to croplands will be the minimum required to meet approved objectives." The specific objective of the Lower Hatchie NWR Cropland Management Plan is as follows:

1. To provide wintering waterfowl habitat for:
Ducks - 5.1 million usedays
Geese - 0.5 million usedays

Although cropland management will be directed primarily to satisfy certain habitat and life requirements of waterfowl, other bird and mammal species will also benefit.

Moist soils management should be considered an integral part of cropland management due to the methods by which these marginal areas of the refuge are manipulated. Approximately 185 acres of the refuges agricultural land are adversely affected by poor drainage caused by man-made and/or natural blockage both on and off refuge. In most years, the affected acreage is managed for natural foods, producing outstanding crops in spite of poor water management capabilities. Some dry summers allow the planting of late soybeans as the cooperative farmers share or grain sorghum for waterfowl, but only in the drier years can corn be planted. Therefore, these areas are typically managed on a three year rotation, employing cooperative farming as a method for setting back natural succession and controlling undesirable pest species.

C. Administration

A "cleared areas" management plan/program was initiated on Lower Hatchie NWR as agricultural lands became available during the initial land acquisition phase of the refuge. The cooperative farming program has been in place since 1982 using the "cleared areas" document in lieu of a croplands plan. The first formal farming/agricultural management plan was developed in January 1995 and is superseded by this document.

Early in the program the refuge maintained agreements with five (5) different farmers. Changes in management needs and administration priorities has reduced the number of cooperative farmers from five to two (2). Contracts with cooperative farmers are renegotiated annually prior to the planting season. At that time the acreage amount and location of the cooperative farmer's share and refuge share are negotiated and all provisions of the agreement are discussed and agreed upon by both parties. The agreement is then signed by the cooperative farmer and the Service representative (refuge manager). Shares are acreage based with a 75% cooperators share and 25% the refuge share. The cooperator assumes responsibility for all associated costs for the crops raised. Modifications to the original contract may occur throughout the farming season with amendments agreed upon and signed by all parties involved.

Special conditions stated in the agreement include the following:

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Milo:	May 1 - June 15
Buckwheat:	July 15 - Aug 15

In the event a preferred seeding date cannot be accomplished, the Cooperator(s) must contact the refuge manager immediately to schedule alternate dates or crops prior to planting.

2. The Service will specify its share to be left standing in the fields, harvested, mowed, or to be logged by the Cooperators(s). The cooperator will notify the Service of any harvesting activity at least 48 hours prior. All manipulations must be completed within 48 hours from the dated of notification unless weather conditions prohibit work.
3. All crops will be fertilized/limed according to current University of Tennessee Soil Testing Laboratory analysis. Soil tests must be taken every three years beginning in 2001. The cooperator is responsible for all soil testing and will provide the Service with the soil test results in designated years.
4. Cooperator (s) will not be permitted to use any herbicide or insecticide prior to the completion and approval of a Pesticide Use Proposal. A list of approved chemicals will be provided to each cooperator. Cooperator (s) may submit additional pesticide use proposals in writing to the manager for emergency approval.
5. The Cooperator (s) must notify the refuge manager 24 hours in advance of any proposed application of fertilizer, herbicide or insecticide.
6. The Cooperator (s) must read and strictly comply with all label instructions on any pesticides used.
7. The Cooperator (s) must meet Tennessee Department of Agriculture requirements for Pesticide Applicator Certification.
8. Cooperator (s) agree that they will not permit the draining or dumping of any materials, and must remove same from the refuge at the end of each day.
9. All farming operations are to conducted in accordance with the Occupational Safety and Health Administration (OSHA) guidelines.

10. The Cooperator (s) will control weeds by cultivation during the growing season if necessary.
11. Weeds and woody vegetation in field borders and turnrows will be controlled by the Cooperator (s) by mowing only (no earlier than July 15).
12. Pesticides approved for use will not be allowed unless the level of pest occurrence observed as a result of crop scouting indicates the pest density is at the economic threshold level. The Cooperator (s) is responsible for crop scouting.

II. Alternatives Including the Proposed Action

C. Alternative 1 - Cropland Management According to Cropland Management Plan (Proposed Action)

The Cropland Management Plan addresses the management of the refuge farm fields which currently total 1,278 acres. These fields are farmed by a cooperator under a contractual agreement, issued annually, with the refuge. Under this agreement, the refuge receives a 25% share of each cooperative farmer's allotment where one acre out of four is planted for waterfowl food production. Thus, approximately 320 acres of corn, millet or milo are planted as the refuge share. For their share (75%), the cooperative farmers plant primarily soybeans. Refuge farmers are required to rotate moist soil areas, when necessary, into their programs as part of the cooperative farming agreements.

In order to provide the optimum feeding areas for waterfowl, the refuge manager annually selects a location in each field where the refuge's share of crops will be planted. The refuge farming coordinator provides special conditions such as soil fertility testing and crop rotation with each agreement to which the farmers must adhere. Reduced tillage or no-till methods are encouraged. Farm field buffers are reserved to help improve water quality and provide additional wildlife habitat. Integrated pest management is enforced by the refuge farming coordinator. These conditions help to ensure that the farmers use soil conservation practices and maximize the production of the refuge's share of the crop.

B. Alternative 2 - No Farming (No Action)

Under this alternative all agricultural areas would be reforested either naturally or by planting bottomland hardwood tree species. The production of grain crops as a management option would not exist.

C. Alternative 3 - Force Account Farming

Under this alternative, farming on the refuge would be performed by refuge employees at the refuge's expense. If the refuge had sufficient resources, i.e.

personnel, equipment, and funding, it would be possible for the refuge to supply enough grain crops for wildlife food production. However, under the current budget and personnel down-sizing constraints, it is unlikely that the refuge will ever be funded adequately enough to perform force account farming.

III. Affected Environment

A. General

The average annual rainfall in the vicinity of the refuge is near 50 inches. The wettest period of the year is January through March, with rains and river flooding conditions common. The driest period of the year is late-July through October, when rainfall is limited and river levels are at their lowest. In most years the cropland areas are flooded by backwater from the Hatchie River. However, Hatchie River levels are affected by Mississippi River levels. High water in the Mississippi will act like a dam, causing the Hatchie River to “back-up” and flood its banks. Extremely low Mississippi River levels will tend to “draw out” water from the Hatchie River, even if heavy rains have elevated the Hatchie River upstream.

Several soil types occur on the refuge including Amagon-Oaklimeter silt loam, Robinsonville-Crevasse-Bruno sandy loams, Sharkey series clays and clayey loams, and Memphis-Alder-Loring silt loams.

B. Vegetation

The vegetation found within the management units varies from agricultural crops, moist soil plant species, and bottomland hardwood tree species. Various grain crops such as corn, soybeans, wheat, millet, and milo are grown on the units, however corn and soybeans predominate.

The moist soil areas located within the farm units contain a variety of wetland plant species. The species present at a particular site vary depending upon site elevation and duration of flooding. Species such as millet (Echinochloa spp.), sprangle top (Leptochloa spp.), smartweed (Polygonum spp.), primrose willow (Ludwigia peploides), sedges (Carex spp.), and rushes (Juncus spp.) are found in the more seasonally flooded areas. Less desirable species such as coffeeweed (Sesbania spp.) and cocklebur (Xanthium strumarium) can be found along the higher edges of the moist soil areas. Tree and shrub species such as willow (Salix spp.), buttonbush (Cephalanthus occidentalis), cottonwood (Populus deltoides), and red maple (Acer rubrum) are also common.

C. Wildlife Including Endangered and Threatened Species

Lower Hatchie NWR supports a tremendous variety of wildlife. The waterfowl sanctuary is seasonally closed to public entry to provide resting area for waterfowl. With the exception of exclusive old-growth forest dwelling bird species, most of the wildlife species which inhabit the refuge also use the farm

units.

Resident mammals utilizing refuge habitats include white-tailed deer (Odocoileus virginianus), gray and fox squirrel (Sciurus carolinensis and S. niger), raccoon (Procyon lotor), bobcat (Lynx rufus), cottontail and swamp rabbit (Sylvilagus floridanus and S. aquaticus), opossum (Didelphis virginiana), skunk (Mephitis mephitis), mink (Mustela vison), muskrat (Ondatra zibethica), and beaver (Castor canadensis).

Wintering waterfowl numbers often reach over 35,000. Also, more than 200 species of non-game resident and migratory birds inhabit the refuge. Avian game species include turkey (Meleagris gallopavo), bobwhite (Colinus virginianus), and mourning dove (Zenaida macroura). A great diversity of aquatic life including fish, reptiles, and amphibians are found throughout refuge waters including those within the refuge farm units.

Within the impoundment system, there are also small native and cool season grassland areas that support a variety of songbird species including nesting field sparrows and dickcissels, and migrating and wintering bobolink's, Henslow's and LeConte's sparrows

The refuge includes the historic range of five federally-listed endangered or threatened species. The endangered Bachman's warbler (Vermivora bachmanii) and gray bat (Myotis grisescens) may be rare inhabitants, but are not verified in the area. The endangered Arctic peregrine falcon (Falco peregrinus tundris) may migrate through during the fall and spring. The bald eagle (Haliaeetus leucocephalus) is a frequent visitor and the interior least tern (Sterna antillarum athalassos) nests on sandbars adjacent to and within the refuge.

IV. Environmental Consequences

This section discusses the environmental impacts of the three alternatives presented.

A. Alternative 1 - Cooperative Farming According to Cropland Management Plan (Proposed Action)

Physical Factors

Soil and Water

Soil disturbance will occur when the areas are disked during spring planting season. However, disturbance and soil erosion will be minimized by the implementation of no-till and conservation tillage farming methods. No disking or ground breaking will be allowed during the fall after harvest without the planting of a cover crop, thus minimizing or eliminating any soil loss/erosion. Water control structures installed for creating moist soil areas will interrupt water flow and retard the rate of erosion. These areas along with grassy waterways and field borders help trap sediments and hold agricultural run-off. These same soil conservation practices will also protect and enhance water quality. Only Regional Office approved agricultural herbicides and pesticides will be used thereby reducing the potential for contamination of nearby water bodies or ground water

reservoirs.

Air Quality

The only significant, negative effects to air quality would be those associated with chemical application. Only those chemicals which have Regional Office approval will be used. Also, in order to minimize any potential drift, aerial application will not be permitted unless field conditions preclude the use of ground application equipment. Some prescribed burning of the moist soil areas may occur in order to set back succession. Any prescribed burning conducted for this purpose will be carried out within conditions that will limit smoke dispersion to acceptable levels, and will comply with the provisions of the Clean Air Act, as amended.

Visual Quality

Spring ground breaking will affect aesthetics, however, these effects will be mitigated by the presence of the heavily vegetated moist soil areas, permanent water impoundments, and field borders. The open fields with alternating cropland and moist soil sloughs will enhance the public's opportunities to view wildlife from a distance.

Archaeological and Cultural Resources

Extra care will be taken in these areas to prevent exposure of these resources. It is possible that ground breaking activities could disturb sites and incidental discovery of archaeological/cultural resources could result from farming activities. If a site is inadvertently uncovered, precautionary steps will be taken to protect it from future disturbance or vandalism. All farming activities will comply with the provisions of the Archaeological Resource Protection Act, the Archaeological and Historic Preservation Act, and the Antiquities Act, and other statutes.

Recreation

All of the farm fields are open to hunting, fishing, and public entry except for the waterfowl sanctuary which is seasonally closed to provide resting areas for wintering waterfowl. Wildlife viewing opportunities will be maximized due to the presence of residual grain or whole crops left in the fields and the habitat created by the moist soil areas. All of these elements combine to offer maximum consumptive and non-consumptive wildlife opportunities.

Biological Factors

Vegetation

Under this alternative the vegetation found within the farm fields will range from various early succession wetland plant species, agricultural grain crops, and bottomland hardwood tree species. The moist soil areas located in the slough areas of the farm units will contain a variety of wetland plant species depending upon site elevation and duration of flooding. Various bottomland hardwood tree species will make up the field borders found along the perimeter of the farm units and along drainage ditches.

Wildlife and Wildlife Habitat, Including Threatened and Endangered Species

This alternative provides habitat for a wide range of wildlife species by assuring a balanced mix of habitat types and wildlife foods. In particular, this management alternative lends itself to providing the habitat requirements for a variety of waterfowl, marsh and wading birds and shorebirds. All three of these species types benefit from the seasonally flooded moist soil areas and the permanent water impoundments which are not only sources of food, but also provide brooding areas and cover. Waterfowl in particular benefit from the grain crops left in field which provide a source of quick energy during cold winter months.

Habitat for the bald eagle will be enhanced by providing tree-lined field borders, especially those associated with seasonally-flooded and permanent water areas. Concentrated waterfowl in the crop fields are an important food source for wintering bald eagles.

Deer and turkey will benefit from the early-successional habitats provided, as well as grain crops left in the fields.

Human disturbance will be a factor during planting and harvest time as well as during the hunting seasons in non-sanctuary areas.

The open cropland present under this alternative may attract nest-parasite bird species, such as brown-headed cowbirds. However, research is inconclusive as to the effect of the size and location of the fields on attracting nest-parasitic birds.

All cropland management activities will be carried out in accordance with the Endangered Species Act of 1973.

Socio-Economic Factors

Agriculture and light industry provide the major sources of income to the West Tennessee area. Major agricultural crops include soybeans, cotton, corn, and grain sorghum. Truck farming and livestock provide a secondary source of income.

The local economy would be aided by cooperative farming on the refuge by local cooperative farmers. Cooperative farming operations provide jobs, purchase equipment and supplies, and provide tax money to the community. Local farming interests would benefit from the demonstration of environmentally-sensitive farming methods.

B. Alternative 2 - No Farming (No Action)

Physical Factors

Soil and Water

No soil/water disturbance would occur if areas were allowed to vegetate naturally. If areas are reforested by planting bottomland hardwood tree species, some

disturbance could occur if disking is done prior to planting. Any impacts that may take place would be minimal and could be mitigated by the effects of natural revegetation.

Air Quality

No negative impacts to air quality would occur.

Visual Quality

Without any agricultural operations on these areas, the farming units would revert to a more natural condition and aesthetic values would be high.

Archaeological and Cultural Resources

Without any agricultural operations on these areas, the potential for disruption to unknown archaeological or cultural resources would be significantly less than in Alternative 1. However, potential for incidental discovery of unknown sites would decrease.

Biological Factors

Vegetation

The farming units would be allowed to revegetate naturally or through planting bottomland hardwood tree species. The areas would initially be colonized by early succession species, such as coffeeweed, broomsedge, ash, and sweetgum. As succession progresses depending upon site elevation, oak species such as nuttall, water, and willow oak would be planted or would eventually be found on the site along with other tree species such as sugarberry and various elm species. Low-lying sloughs would still harbor various moist soil plant species, if managed. The areas would eventually revert back to bottomland hardwood forest and would be managed accordingly.

Wildlife and Wildlife Habitat, Including Threatened and Endangered Species

The alternative would provide less than optimal conditions for wintering waterfowl. No crop production would have negative impacts for both duck and goose species. Waterfowl would no longer be able to utilize refuge grain crops to boost fat reserves and provide high levels of metabolizable energy in preparation for spring migration. It is likely that refuge waterfowl use would decrease.

Deer and other species would not have available crops such as corn and wheat which have become important elements of their diet. It is possible that these species could be displaced to other areas containing these crops, thus causing them to be more vulnerable to hunting pressure, disturbance and poaching.

Management of the refuge moist soil areas could likely continue, therefore, marsh and wading birds, shorebirds and duck species could still benefit from moist soil management. In the event that moist soil management would not continue, values for these species would decline due to invasion by woody plant species.

Because the croplands would eventually be reforested, white-tailed deer, turkey, neotropical forest dwelling bird species, and some duck species would eventually benefit from mast producing trees. However, these trees would not produce until they reach 25-30 years of age. During the interim the refuge could only provide foods found in the moist soil areas or flooded timber portions of the refuge.

Socio-Economic Factors

The local economy would not receive the economic benefits of crops being grown on the refuge by local farmers. The demonstration of environmentally sensitive farming would not longer take place, thus eliminating educational opportunities for local farming interests.

C. Alternative 3 - Force Account Farming

Physical Factors

Soil and Water

It is likely that disturbance to soil and water would be similar to that of Alternative 1, although probably to slightly a lesser degree due to a smaller acreage being farmed.

Air Quality

Impacts and mitigation would be the same as for Alternative 1 for application of chemicals.

Visual Quality

Because of a smaller number of acres in cropland, visual aesthetics would likely be higher than those of Alternative 1. Because a portion of the area would remain in cropland, opportunities for viewing wildlife would still be present.

Archaeological and Cultural Resources

The potential for disturbance to archaeological/cultural resources would be somewhat less than those in Alternative 1. Mitigation is as discussed in Alternative 1.

Recreation

Recreational opportunities and/or impacts are the same as those listed in Alternative 1.

Biological Factors

Vegetation

Vegetational characteristics would be similar to those listed under Alternative 1. However, a larger amount of acres would be present in native bottomland hardwood species due to a likely reduction in the number of acres farmed. Pest plant species management options through crop rotation could be hindered due to a reduction in variety of crops planted and fewer acres in which to rotate crops.

Wildlife and Wildlife Habitat, Including Threatened and Endangered

Impacts to refuge wildlife species would be similar to those listed in Alternative 1. A larger component of mast producing trees would likely be present due to a reduction in acres of cropland, thereby enhancing conditions for some species.

Socio-Economic Factors

Impacts to the local economy would be the same as those listed in Alternative 2. When compared to cooperative farming, force account farming is not an economically feasible alternative for the refuge.

V. Consultation and Coordination

The Cropland Management Plan will undergo agency review and will be open for public comment from private and other governmental agencies. Following a waterfowl review conducted by the waterfowl focus group of the West Tennessee Wildlife Resources Conservation Plan Committee, it was recommended that the acres of cropland available for waterfowl continue to be implemented, and other areas developed as needed.

Public meetings will be held in _____, during July, 1995, announcing the availability of this environmental assessment in draft form for public review and comment. The attached comments were received from the public.